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10/806,414	03/23/2004	Kimiaki Ando	1743/232	2294

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EXAMINER	
JOHNSTON, PHILLIP A	

ART UNIT	PAPER NUMBER
2881	

DATE MAILED: 04/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/806,414	ANDO ET AL.	
	Examiner	Art Unit	
	Phillip A. Johnston	2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 January 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☒ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Detailed Action

1. This Office Action is submitted in response to amendment dated 1-18-2005, wherein claims 1-19 are pending.

Claims Rejection – 35 U.S.C. 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.
>
> The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e).

3. Claims 1,3-10,12-17, and 19 stand rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,275,604, to Miyajima.

Regarding claims 1,5, and 7, Miyajima (604) discloses the following;

An electron beam (EB) exposure apparatus in Fig. 1, having a stencil mask (or block mask) 12 and a plate 11 having a rectangular opening 13. As shown in FIG. 2, the stencil mask 12 has a plurality of first transmission apertures 14 having rectangular

shapes, and a plurality of block areas 15 (including a parallelogrammatic aperture). An electron beam 10 is deflected by a first electromagnetic deflector 19 before passing the plate 11. The electron beam 10 is then deflected by a second electromagnetic deflector 20 before passing any one of the first to third transmission apertures 14-17 of the stencil mask 12. Accordingly, the cross-sectional shape of the electron beam 10 or the shape of its exposure pattern is changed. The electron beam 10 after it has passed the stencil mask 12, is further deflected by a third electromagnetic deflector 21. As a platform or stage 22 is moved along the X and Y axes, a desired pattern is exposed on a predetermined area of a wafer 23 located on the stage 22.

The size of a rectangular pattern exposed on the wafer 23 is determined by adjusting the degree of overlapping of the beam passing through the plate 11 with the associated first transmission aperture 14. See Column 1, lines 10-15, and 31-46; also Figures 1 and 2 below;

Fig.1 (Prior Art)

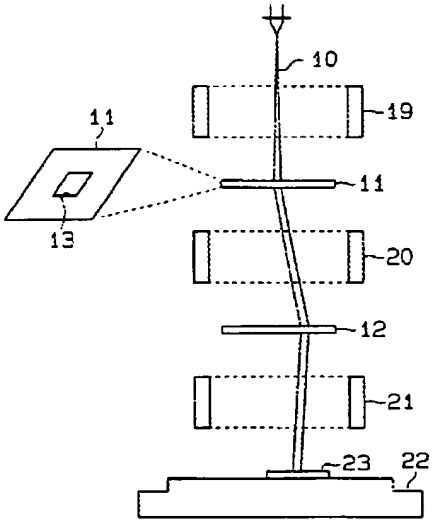
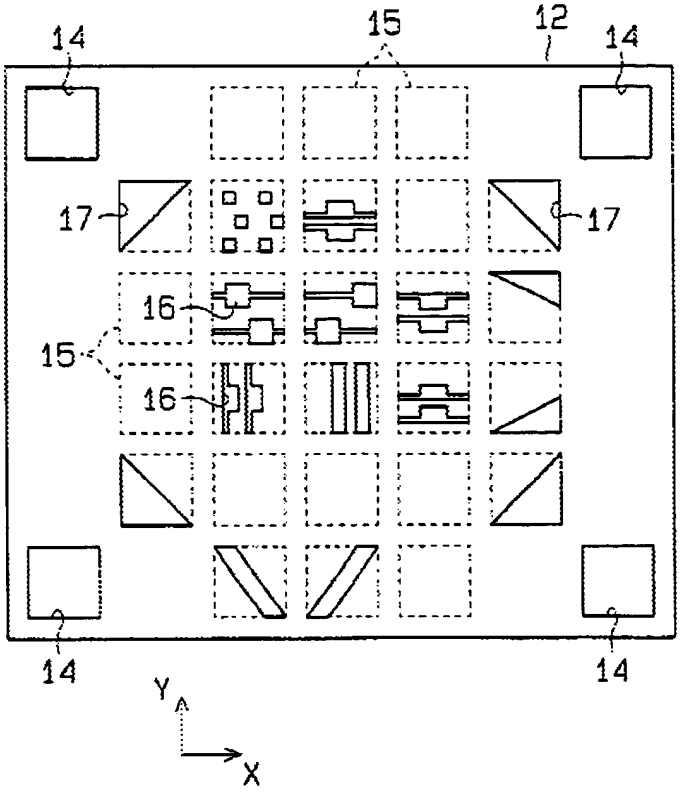


Fig.2(Prior Art)



Regarding claim 3, Miyajima (604) discloses that, the CPU 32 selects a segmental block pattern, which approximates the modified second pattern 72. In this case, the CPU 32 selects a segmental block pattern BP(11) with a number "11" in FIG. 10 (indicated by the broken line in FIG. 13C).

The CPU 32 then enlarges the segmental block pattern BP(11) to generate an enlarged pattern 74. At this time, the length of the left side and the side D of the enlarged pattern 74 substantially coincide with each other. The CPU 32 acquires, as a difference value, a difference ($\Delta y2$) between the side A1 (or the side C1) of the

enlarged pattern 74 and the side A of the second pattern 72 in the direction of the Y axis. When determining that the difference value Δy2is within the error allowance value range, the CPU 32 modifies the second pattern 72 to the segmental block pattern BP(11). That is, the CPU 32 stores the number "11" of the selected segmental block pattern BP(11) in a data area 75a, information indicative of "segmentation", a block type, in a data area 75b, and information indicative of "parallelogram", a pattern shape, in a data area 75c as shown in FIG. 14. Further, the CPU 32 stores the X coordinate and Y coordinate at which the second pattern should be laid out, in data areas 75d and 75e, and pattern size information in a data area 75f. As shown in FIG. 13D, exposure is carried out using the segmental block pattern BP(11) instead of the second pattern 72. See Column 11, line 57-67; and Column 12, line 1-15; and Figure 13D below.

Fig.13C

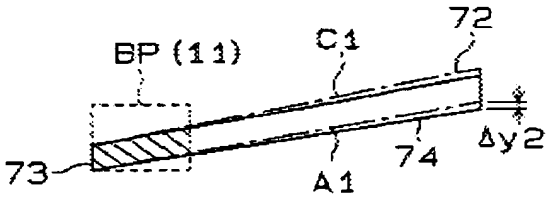
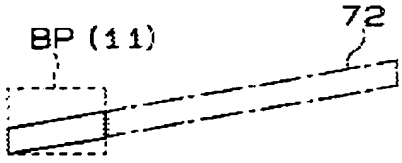


Fig.13D



Regarding claims 4,6,8,12-15, and 19, Miyajima (604) discloses the following;

An exposure data generating apparatus 31 comprises a central processing unit (CPU) 32, a memory unit 33, an MT (Magnetic Tape) drive 34, a terminal unit 35 and a 25 disk drive 36. The units 33 to 36 are all connected to the CPU 32.

An operator operates the terminal unit 35 to instruct the CPU 32 to execute the exposure data generating process using the program data.

The CPU 32 receives pattern data from the first data file 41 and executes an exposure data generating process according to steps S1 to S8 using the pattern data.

Next, the CPU 32 receives segmental block pattern data to be mounted on the stencil mask 12 of FIG. 2 from the disk drive 36 (segmental block data inputting process) in step S5. The segmental block pattern data is stored (equivalent to the code of claims 6, 13, and 19) in advance in the disk drive as control statements 48.

When layout data of a polygon equal to or greater than a pentagon exists, the CPU 32 carries out a segmentation process, segmenting the layout pattern into a triangular layout pattern and a rectangular layout pattern. The CPU 32 stores the processed layout pattern as intermediate processed data in the second data file 42, as recited in claims 4,13, and 19.

CPU 32 then modifies the pattern data to segmental block pattern data, which leads to an improvement on the linearity of the oblique side of each pattern.

The exposure apparatus shown in FIG. 1 receives from the exposure data generating apparatus 31 the exposure data stored in the seventh data file 47 and uses the exposure data to expose the desired pattern at a predetermined position on the

wafer 23 while controlling the first to third electromagnetic deflectors 19-21 and the stage 22.

FIG. 6 is a flowchart illustrating substeps of step 6, the shape modification process. In step S11, the CPU 32 reads the first pattern data from the third data file 43, and then recognizes if one pattern data is triangular or rectangular (shape recognition process) in step S12. The shape recognition process is performed such that different modification processes are executed according to recognized shapes. See Column 6, line 7-67; and Column 7, line 1-49.

It is implied herein that, the use of the shape modification process in accordance with Miyajima (604) is equivalent to the use of a variable parallelogramatic aperture, as recited in claims 4,6,8,12-15, and 19.

Regarding claims 9,10, and 16-18, Miyajima (604) discloses the following;

When the first pattern data is triangular, the CPU 32 specifies two sides that define the largest one of the three internal angles. When the first pattern data is rectangular, the CPU 32 specifies two opposite sides. The CPU 32 acquires the amount of change that is produced by shifting at least one of the specified two sides in the horizontal direction (parallel to the X axis) or the vertical direction (perpendicular to the X axis and parallel to the Y axis). See Column 8, line 10-17.

FIG. 8B shows, as a second example, first pattern data of an original parallelogram indicated by the solid line and first pattern data of a parallelogram after modification, indicated by the dashed line. The CPU 32 shifts the sides A, B and C of the parallelogram while maintaining the parallelism of the sides A and C. Thus, two

points of intersection of the sides A and C and the side B shift along the Y axis, and the amount of displacement (i.e., a difference Δy between the Y coordinates of each intersecting point) is determined as the amount of change. See Column 8, line 43-52.

It is implied herein that, since the CPU 32, having modified the exposure shapes by performing the oblique segmentation process, and then commands the exposure apparatus in Figure 1, to draw the desired pattern while controlling the deflectors and the stage, requires deflecting the beam to newly defined coordinates, which is equivalent to adapting the deflector as recited in claims 9,10, and 16-18.

Claims Rejection – 35 U.S.C. 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

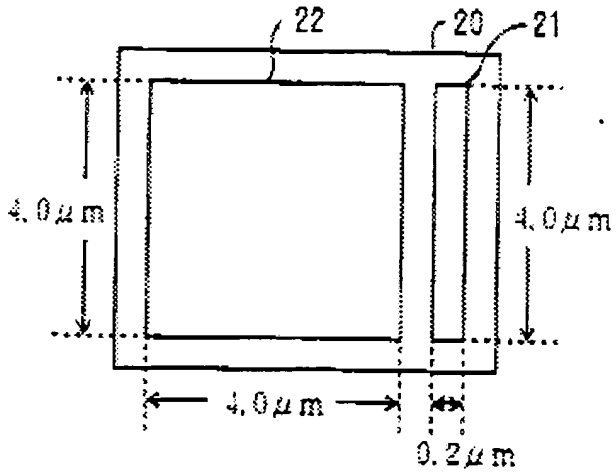
5. Claims 2,11, and 18 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,275,604, to Miyajima, in view of Sakakibara, U.S. Patent No. 5,952,155.

Miyajima (604) as applied above fails to teach the use of an aperture width of 1μm or less. However, Sakakibara (155) discloses in n a block 20 of FIG. 13A, an

aperture 21 has a width of 0.2 μm and a length of 4.0 μm, and an aperture 22 is a 4.0 μm square.See Column 13, line 41-46; and Figure 13A below.

Therefore it would have been obvious to one of ordinary skill in the art that the exposure apparatus and method of Miyajima (604) can be modified to use an aperture width less than 1μm in accordance with Sakakibara (155), to provide a mask having micro apertures, which makes it possible to limit the current amount of the electron beam passing through the apertures.

FIG. 13A



Examiners Response to Arguments

6. Applicant's arguments filed 1-18-2005 have been fully considered but they are not persuasive.

Argument 1.

Applicant states that "The fundamental difference between Miyajima's teaching and the presently claimed invention is that the drawing method of Miyajima is to use fixed figures and parallelogramatic apertures, but the drawing method presently claimed is to use size-variable parallelogramatic apertures. The generation of such size-variable parallelogramatic apertures is in no way taught or suggest by Miyajima. Nor does Sakakibara make up for the missing teaching. Thus, all claims in this application are in condition for allowance, prompt notice of which is respectfully solicited."

The applicant is respectfully directed to Miyajima (604), Column 2, line 5-22, which states; FIG. 3B shows a pattern formed by combining triangular patterns 26a and 26b, and rectangular patterns 27a and 27b to improve the linearity of the oblique side 24 of the pattern. The triangular patterns 26a and 26b are formed by the third transmission aperture 17 formed in the stencil mask 12. The third transmission aperture 17 has a right-triangular shape including an oblique side, which has the same inclination as the oblique side 24 of the pattern. The pattern can be formed with fewer shots than is required by the scheme in FIG. 3A by individually shooting the triangular patterns 26a and 26b and the rectangular patterns 27a and 27b. The triangular pattern 26b having a relatively small size is obtained by adjusting the degree of overlapping of the beam 10, which has passed the plate 11, with the associated third transmission aperture 17. The rectangular patterns 27a and 27b are obtained by

adjusting the degree of overlapping of the beam 10, which has passed the plate 11, with the associated first transmission aperture 14.

Also Column 7, line 44-49, which states; The exposure apparatus shown in FIG. 1 receives from the exposure data generating apparatus 31 the exposure data stored in the seventh data file 47 and uses the exposure data to expose the desired pattern at a predetermined position on the wafer 23 while controlling the first to third electromagnetic deflectors 19-21 and the stage 22.

As well as, Column 9, line 40-60, which states; FIG. 10 shows predetermined registered segmental block patterns. Each segmental block has a pattern formed by a transmission aperture of its own predetermined shape (hatched). A specific block number is assigned to each segmental block. This block number is assigned to an area 52a of segmental block pattern data 52 shown in FIG. 9B. The exposure apparatus selects the block area 15 on the stencil mask 12 where the transmission aperture 17 corresponding in shape to the block pattern that has been selected based on the block number. As a result, the block pattern corresponding to the block number is exposed on the wafer 23. Exposure data includes the segmental block pattern data 52 in FIG. 9B and recursive block data 51 in FIG. 9A and pattern data 53 in FIG. 9C.

The CPU 32 then enlarges or reduces data of the selected block pattern in the X and Y directions in such a way that the size of the selected block pattern substantially coincides with the size of the second pattern data. The CPU 32 further computes a difference between the coordinates of each side of the enlarged or reduced block pattern with the coordinates of each associated side of the second pattern data.

The examiner has interpreted from the Miyajima (604) references above that the drawing method of Miyajima (604) is accomplished by adjusting the degree of overlap of the beam 10 on apertures located on the stencil mask 12, using deflectors 19 and 20; as well as, fine tuning the pattern shape exposed on the wafer 23 by selecting an aperture on the mask 12 then modifying and storing the optimized deflection coordinates in CPU 32, which is a method that requires adjusting deflectors, to vary the image size on the wafer using parallelogram shaped apertures located on the mask, equivalent to the applicants claimed invention.

Conclusion

7. The Amendment filed on 1-18-2005 under 37 CFR 1.131 has been considered but is ineffective to overcome the Miyajima (604) and Sakakibara (155) references.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

8. Any inquiry concerning this communication or earlier communications should be directed to Phillip Johnston whose telephone number is (571) 272-2475. The examiner can normally be reached on Monday-Friday from 7:30 am to 4:00 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiners supervisor John Lee can be reached at (571) 272-2477. The fax phone number for the organization where the application or proceeding is assigned is 703 872 9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PJ
April 6, 2005

JOHN R. LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800